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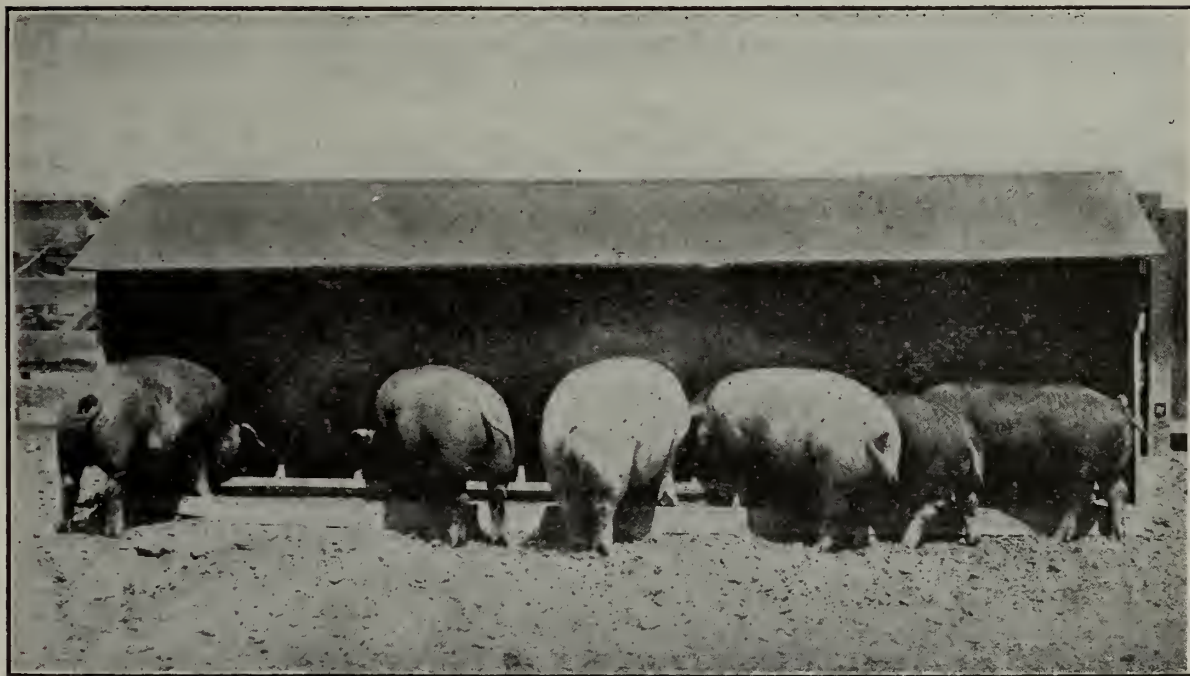
COLLEGE OF AGRICULTURE  
AGRICULTURAL EXPERIMENT STATION  
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# HOG FEEDING EXPERIMENTS

BY

J. I. THOMPSON AND EDWIN C. VOORHIES



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# HOG FEEDING EXPERIMENTS

BY J. I. THOMPSON AND EDWIN C. VOORHIES

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The importance of pork production as a phase of the business of the California rancher is likely to increase. Large ranches are gradually being subdivided, the alfalfa acreage is increasing, and more intensive methods are coming into practice. The value of livestock as a part of general or specialized farming is receiving more attention each year, and hog raising is being given due consideration. The price of barley generally fluctuates quite independently of the price of hogs. Barley is therefore often too costly to yield a profit when used as hog food. This condition compels the producers to try one or more of the various farm or factory by-products as a substitute for all or part of the barley, and accounts for the great variety of feeds found in various hog rations fed in this state. It is doubtful if there is any other part of this country where hogs can be utilized so profitably to consume farm by-products.

Alfalfa has no equal as a forage crop for hogs under the conditions obtaining in this state and is the common roughage fed here, either as pasture or green feed, or as hay. Barley, on the other hand, is the standard grain fed to hogs. Since barley is often high in price, it is important that definite information should be obtained as to how barley can best be supplemented for most economical returns in hog feeding, and what feeds, if any, are satisfactory substitutes. Pasture is generally available in this state throughout the year except for the months of December, January, and February. Fall pigs marketed at about 200 lbs. to 225 lbs. receive most of their finishing in dry lots. Hence, experiments in swine feeding conducted by the Division of Animal Husbandry during the past six years have been carried on along the two lines of pasture feeding and dry-lot feeding. The present bulletin contains accounts of this experimental work, and is accordingly divided into two parts: Part I, Pasture Feeding, from 1914 to 1919, inclusive, and Part II, Dry-Lot Feeding, 1914 to 1919.

The specific subjects concerning which information was sought in the experiments were as follows:

1. How much pork can be produced on alfalfa when supplementary grain is fed?
2. How much barley is needed in conjunction with alfalfa pasture to produce a pound of pork?



3. What are the relative values of various supplementary hog feeds, such as tankage, wheat shorts (middlings), coconut meal, beans, etc.?

4. Is it feasible to cut alfalfa and feed it in racks instead of allowing the hogs to graze on it?

5. Are self feeders practicable for hogs?

*Animals used.*—All of the pigs used were pure-breds. Each lot contained the same number of animals and these were equally divided as far as possible in regard to breed, sex, weight, and vigor. The following breeds were used: Berkshire, Chester-White, Poland-China, Hampshire, and Yorkshire.

*Weighings.*—All pigs were weighed separately on the second day of the experiments, and collectively for the first two days. The average of these weights is taken as the initial weight. They were further weighed collectively each two weeks during the experiments. On each of the last two or three days they were weighed collectively and individually, and the average of these last weighings used as the final weight. All experiments began with the evening feeding on the first day and ended with the morning feeding on the last day.

*Feeding.*—All lots fed by hand received their daily feed in two equal parts at regular hours in the morning and evening. All grain rations were soaked from one feeding to the next, except those in the self-feeders and the milo fed in Trials III and IV, which were fed dry. The beans were cooked in an open kettle, a little salt being used. All proportions given are by weight. Water was freely supplied.

*Feeds used.*—The barley used was home-grown, of average quality, and was nearly always rolled. When it was impossible to get it rolled, a small amount was ground. The wheat shorts, so-called, were meant to be choice "white middlings," but varied considerably in quality and in per cent of flour. The tankage was digester tankage, supposed to contain 50 per cent total protein. The coconut meal was guaranteed to contain about 21 per cent of protein, 40 per cent of Nitrogen-free extract, and  $8\frac{1}{4}$  per cent of fat.

## PART I

### TRIAL I.—THE VALUE OF SUPPLEMENTARY FEEDS IN CONJUNCTION WITH ALFALFA PASTURE FOR PORK PRODUCTION

Forty-four spring pigs, about four and one-half months old and weighing about ninety-five pounds each at the beginning of the experiment, were selected and separated into two lots of twenty-two each, and fed as follows:

Lot I. Rolled barley, alfalfa pasture.

Lot II. Rolled barley, alfalfa pasture, and tankage.

It was necessary to feed wheat shorts to Lot II in this experiment for two weeks time, because the shipment of tankage failed to arrive.

Each of these lots was placed in a half-acre alfalfa pasture and allowed all the grain or grain and tankage from self-feeders that they could consume.

The results are shown in Table I.

The only advantage from feeding tankage shown in this experiment was in the last forty days after the pasture became poor, and in the increased finish. So long as the alfalfa was abundant and fine, there was apparently no need of additional protein. The increased finish secured on Lot II, however, more than paid for the extra cost of the tankage.

### TRIAL II.—PORK PRODUCTION WITH CONCENTRATES AND ALFALFA PASTURE

Ninety-six spring pigs averaging four months of age and weighing on the average about seventy-two lbs. each at the beginning of the experiment, were selected and separated into eight lots of twelve pigs each, that were fed as follows:

Lot I. In dry corral. Soaked rolled barley only.

Lot II. Alfalfa pasture. Soaked rolled barley.

Lot III. Alfalfa pasture. Rolled barley in self feeder.

Lot IV. Alfalfa pasture. Rolled barley and tankage in self feeders.

Lot V. In dry corral. The same amount of soaked rolled barley as Lot II, with green alfalfa cut, weighed, and fed in racks twice daily.

Lot VI. Alfalfa pasture. Same amount of concentrates as Lot II, but consisting of soaked rolled barley two parts, and wheat shorts (middlings) one part.

TABLE I  
22 PIGS IN EACH LOT TEST LASTED 84 DAYS  
August 25 to November 17, 1914

Lot	Ration	Lbs. initial average weight	Lbs. final weight	Lbs. total gain per pig	Lbs. average daily gain per pig	Lbs. total feed consumed per pig	Lbs. average feed consumed per pig	Lbs. feed consumed per lb. gain
I	Barley, rolled, and alfalfa pasture, self-feeder	94.2	205.1	110.9	1.32	517.25	6.15	4 65 barley and alfalfa pasture
II	Barley, rolled, tankage, and alfalfa pasture, self-feeder	94.6	212.5	117.9	1.40	549.84	6.55	4.37 barley .11 tankage .16 shorts and alfalfa pasture

NOTE.—Pasture was of little value after October 20, 1914.



Lot VII. Alfalfa pasture. Same amount of concentrates as Lot II, but consisting of soaked rolled barley two parts, coconut meal one part.

Lot VIII. Alfalfa pasture. Same amount of concentrates as Lot II, but consisting of soaked rolled barley two parts, cull beans one part.

The pasture lots were one-half acre in size. It was not intended to cook the beans, because the average ranch is not equipped to do so. However, since the pigs refused to eat them, cooking was necessary. A little salt was added to the beans.

The results obtained in the trial are shown in Table II.

Lot I ate the most grain for a pound of gain. Lots II, V, VI, VII, and VIII, did not eat nearly so much a day or during the feeding period as did Lots III and IV on the self feeders, but all required about the same amount for a pound of gain, except Lot VII, which was slightly below the others. Since it was deemed necessary to market all of the hogs at one time, this comparison is hardly fair to Lots III and IV, as they were much heavier than the other lots. They required less feed for each pound of gain up to the same weights finally reached by the other hogs. The only advantage economically of the tankage in Lot IV seems to have been that it enabled the pigs to eat more grain, hence reach a heavier weight in less time than those not receiving it. They showed more finish and dressed higher, which caused them to sell higher.

Lot V required as much grain for each pound of gain as Lot II, but there was a slight saving in alfalfa area. However, these pigs lacked finish, dressed very low and sold low. The labor cost was necessarily high.

Lot VI showed fairly desirable gains, the only question being the ability to buy shorts at a reasonable price.

Lot VII proved to be most economical in food consumption, but one part of coconut meal to two of barley proved to be too laxative when fed in conjunction with alfalfa pasture.

In the proportion fed in Lot VIII, beans produced fair gains, but the product from the packers' viewpoint was anything but desirable. The dressing percentage was unusually low (63.8 per cent), and the carcasses very soft, flabby and watery.

TABLE II

12 PIGS IN EACH LOT. 84 DAYS ON TEST

July 30-October 22, 1915

	Lot	Ration	Lbs. average initial weight	Lbs. weight October 22	Lbs. average total gain	Lbs. average daily gain per pig	Total lbs. con- sumed per pig	Lbs. daily feed per pig	Lbs. feed consumed per lb. gain	Sell- ing price at San Francisco	Dressing per cent- age
I	Soaked	rolled barley - dry lot	74.8	133.8	59.0	.70	310.3	3.69	5.26	5 <sup>3</sup> / <sub>4</sub> c	68.2
II	Soaked	rolled barley-alfalfa pasture	73.2	140.0	66.8	.79	246.1	2.93	3.76 and pasture	6 <sup>1</sup> / <sub>2</sub> c	74.2
III	Rolled	barley, self-feeder, alfalfa pasture	74.6	183.2	108.6	1.28	427.5	5.09	3.93 and pasture	6 <sup>3</sup> / <sub>4</sub> c	80.5
IV	Rolled	barley, tankage in self-feeders, alfalfa pas- ture	73.8	190.3	116.5	1.39	481.3	5.73	3.84 barley .28 tankage and pasture	.7c	82.9
V	Rolled	barley, cut green alfalfa dry lot	71.1	133.3	60.8	.72	235.0 barley 301.3 alfalfa	2.79 barley 3.58 alfalfa green alfalfa	3.86 barley 4.95	5 <sup>3</sup> / <sub>4</sub> c	67.1
VI	Rolled	barley 1 part, shorts 1 part (hand fed) alfalfa pasture	74.8	136.9	62.2	.74	235.0	2.79	2.52 barley 1.25 shorts and pasture	6 <sup>1</sup> / <sub>2</sub> c	76.2
VII	Rolled	barley 2 parts, coco- nut meal 1 part (hand fed) alfalfa pasture	74.3	141.2	67.0	.80	235.0	2.79	2.38 barley 1.12 coc. meal and pasture	6 <sup>1</sup> / <sub>2</sub> c	72.7
VIII	Rolled	barley 2 parts, cull beans 1 part (hand fed), alfalfa pasture	75.7	138.4	62.7	.75	232.8	2.77	2.49 barley 1.21 beans and pasture	5 <sup>1</sup> / <sub>2</sub> c	63.8



TABLE III  
12 PIGS IN EACH LOT. TEST LASTED 98 DAYS  
July 11-October 17, 1916

Lot	Ration	Lbs. average initial weight	Lbs. average final weight	Lbs. average total gain per pig	Lbs. average daily gain per pig	Lbs. total feed consumed per pig	Lbs. average daily feed consumed	Lbs. feed consumed per lb. gain	Selling price	Dressing percentage
I	Soaked rolled barley Dry corral	102.2	193.7	91.5	.93	548.6	5.60	5.99	8.75 for 8 8.00 for others	77.7 73.6
II	Soaked rolled barley Alfalfa pasture	101.0	212.3	111.3	1.14	538.0 and alfalfa pasture	5.49	5.20 and alfalfa pasture	8.95	79.8
III	Rolled barley-self feeder Alfalfa pasture	100.9	220.0	119.1	1.22	530.0 and alfalfa pasture	5.41	4.45 and alfalfa pasture	8.95	79.1
IV	Rolled barley, tankage- self feeder alfalfa pasture	100.8	223.7	122.9	1.25	560.0 and alfalfa pasture	5.71	4.42 barley and pasture .14 tankage	8.95	78.8
V	Rolled soaked barley, cut green alfalfa. Dry corral	102.1	200.8	98.7	1.01	548.7 barley 157.5 alfalfa	5.60 barley 1.61 alfalfa	5.60 barley 1.60 alfalfa	8.95	78.7
VI	Rolled barley, 2-3 Wheat shorts 1 Alfalfa pasture	103.3	226.7	123.4	1.26	618.4 alfalfa pasture	6.31	3.50 barley 1.50 shorts alfalfa pasture	9.05	80.3
VII	Rolled barley 3-4 Coconut meal 1 alfalfa pasture	103.3	227.3	124.0	1.27	585.0 alfalfa pasture	5.87	3.60 barley 1.10 coconut meal alfalfa pasture	9.05	80.0
VIII	Ground milo maize Tankage-self feeders Alfalfa pasture	102.8	254.0	151.2	1.54	620.3 alfalfa pasture	6.33	4.00 milo .1 tankage alfalfa pasture	9.35	83.1

## TRIAL IIA.—CONTINUATION OF TRIAL II

The only difference between this trial and the previous one, is in Lots VI, VII, and VIII. In Lot VI the proportion of barley to shorts was started at two to one, as before, but gradually widened to three to one as the experiment progressed. On account of the trouble with scouring experienced in the previous trial, Lot VII of this bunch was started on barley three parts, coconut meal one part, and gradually widened to four to one. Lot VIII was entirely different, ground milo maize and tankage being fed in separate self feeders, instead of barley and beans as in the previous one. The pasture lots were the same, one-half acre each.

The results are shown in Table III.

The pigs in this experiment were heavier at the finish, so that more feed was required for each pound of gain than in the previous one. Other than this, the only irregularity is that Lot IV did not show nearly so favorably in dressing percentage and did not make relatively so large gains as pigs similarly fed in previous years.

The showing of Lot VIII on milo maize is especially interesting, but should not be considered final. Further tests on this feed are to be made as soon as possible.

## TRIAL III.—TO DETERMINE THE RELATIVE ECONOMY OF A LIMITED COMPARED WITH A HEAVY GRAIN RATION IN CONJUNCTION WITH ALFALFA PASTURE

As before stated, grain is often relatively much higher in price in California, when compared with the price of hogs. At such times it is important to know whether the concentrated part of the ration may be limited, thereby forcing the pigs to eat relatively more alfalfa. It is conceded that the gains will be less rapid. How limited a grain ration can be profitably fed is the question.

In order to acquire some data on this question, five lots of ten pigs each were fed as follows, each lot being allowed one-half acre of alfalfa pasture.

Lot I. One pound rolled barley daily for each 100 lbs. of live weight.

Lot II. Two pounds rolled barley daily for each 100 lbs. live weight.

Lot III. Three pounds rolled barley daily for each 100 lbs. live weight.

Lot IV. Barley in self feeder.

Lot V. Barley and coconut meal in separate self feeders.

On November 23, 1917, the results were as follows:

TABLE IV  
July 11-November 23, 1917, 135 Days

Lot	Ration	Ave. initial weight lbs.	Ave. final weight lbs.	Ave. daily gain lbs.	Average daily feed lbs.	Feed consumed for 100 lbs. gain
I*	1% ground barley.....	60	106	.34	.79	230
II	2% ground barley.....	61	138	.57	1.80	317
III	3% ground barley.....	61	174	.83	3.18	382
IV*	Full feed, ground barley (self feeder).....	59	213	1.14	5.49	480
V*	Full feed, ground barley & coconut meal (separate self feeders).....	60	223	1.21	<div> <div>5.46</div> <div>barley</div> <div>.15</div> <div>coconut</div> <div>meal</div> </div>	<div> <div>450</div> <div>barley</div> <div>13</div> <div>coconut</div> <div>meal</div> </div>
					5.61	463

\*Nine pigs—one pig in each of these lots died.

It will be noted that there was a wide variation in the average weights of these lots at the close of the feeding period of 135 days, when Lot V was ready for market. It was decided to continue feeding all of the other lots in dry corrals until each lot had reached an average weight of 223 lbs. Since Lot IV had only ten pounds per pig to gain, the ration was not changed. The other lots were fed barley and cocoanut meal.

It required seven more days for Lot IV to reach this weight, the feed consumed for 100 lbs. gain remaining the same, namely, 480 lbs.

Twenty-eight additional days were required for Lot III to reach 223 lbs., the average feed for 100 lbs. gain being for the entire period 404 lbs. barley and .05 lb. coconut meal. Forty-five days more were required for Lot II, the feed for 100 lbs. gain being 409 lbs. barley and .06 lb. coconut meal for the entire period.

It was impossible to estimate accurately the relative amount of pasture needed by these various lots, but it was very evident that Lots I and II needed more area, and Lot III consumed relatively more of their pasture than did Lots IV and V. In fact, the areas allotted to IV and V could readily have carried twice as many pigs. Lot III was about balanced, Lot II needed some more, and Lot I about twice as much. The grain consumed for 100 lbs. gain increased directly with the amount of grain allowed for the first period, but there was little difference in the amount required by the time they were ready for market.



The question that the individual hog raiser will need to decide for himself is when the price of grain is sufficiently high to justify the additional risk, labor, and interest in investment incurred when much additional time is required to get the hogs ready for market. The indications are that at least a 3 per cent grain ration is desirable for economical gains. Ground barley and coconut meal in self feeders was found more economical than ground barley fed alone.

SUMMARY OF TRIALS. PART I

TABLE V

Kinds of Feed	Number of trials	Average daily gain, lbs.	Average feed consumed per lb. gain, lbs.
Barley, dry corral.....	2	.82	5.63
Barley and alfalfa pasture.....	2	.96	4.48 and alfalfa pasture
Barley in self-feeder alfalfa pasture.....	3	1.27	4.31 and alfalfa pasture
Barley, tankage, self-feeders, alfalfa pasture	3	1.34	4.21 barley .18 tankage and alfalfa pasture
Barley, dry lot, cut green alfalfa.....	2	.91	4.73 barley 3.27 alfalfa
Barley, shorts, alfalfa pasture.....	2	1.00	3.01 barley 1.37 shorts and alfalfa pasture
Barley, coconut meal, alfalfa pasture.....	3	1.03	2.99 barley 1.11 coconut meal and alfalfa pasture

If greater gains are made from a given amount of barley and alfalfa pasture than from the same amount of barley fed in a dry lot, the difference should be credited to the alfalfa. When lots so fed are compared from the above table, it will be found that pigs on alfalfa pasture gained .14 lb. more rapidly per day, and that 1.15 lbs. less of barley were used to make a pound of gain. The greater gain per day and the less feed consumed per pound of gain should be credited to the alfalfa.

The self feeder lots show even greater gains and more saving in feed.

Approximately 4½ lbs. of barley were required for each pound of gain to grow pigs from 75 lbs. up to 200 lbs. when they were hand fed. Approximately 4 per cent less barley was required for each pound of gain between 75 lbs. and 200 lbs. weight when hogs had access to self feeders.

As much barley and tankage were required for each pound of gain as of barley alone, but the extra finish of those fed tankage produced, on the average, a slightly greater profit.

The soiling system seems to produce gains about 5 per cent more costly in grain than when pasture is used.

Unless shorts (middlings) are of good or excellent quality, they are worth no more per pound than barley for pigs weighing 75 lbs. or more when being fed for market, so long as good alfalfa pasture is available. However, the pigs fed barley and shorts were slightly trimmer in the paunch, glossier in the hair, and dressed somewhat higher than those fed barley without shorts.

#### GENERAL CONCLUSIONS

1. Pigs having access to self feeders eat more grain daily on the average than those fed by hand.

2. Pigs on self feeders grow evenly. When hand-fed, the larger pigs usually grow relatively faster than the smaller.

3. Self feeders reduce the labor cost, and make it possible for less feed to produce a pound of gain than is true of hand feeding.

4. Self-fed pigs gain faster than hand-fed. The difference in the economy of the two systems is greater than is apparent in the figures given, for, owing to a better finish, high dressing percentage and greater uniformity they sold higher in all cases and made a greater profit.

5. In all the self feeder lots, there has been an over-supply of alfalfa when twelve pigs were pastured on a half-acre field. It seemed that these lots could have carried 50 per cent more pigs, or eighteen to the lot, as efficiently as the hand-fed lots carried twelve pigs.

6. Beans produced a fair rate of gain, but the carcasses were soft, flabby, and watery, and the dressing percentage very low.

7. Coconut meal proved to be a desirable supplement for barley, when fed in the proportion of one pound to three or four pounds of barley. A larger proportion of coconut meal exerted too laxative an effect when fed in conjunction with alfalfa pasture.

8. Coconut meal may be used to make up from one-third to one-fourth of the ration, so long as it does not cost over 20 per cent more than barley. According to the results of this single experiment, beans are worth only 40c per hundred pounds when barley is worth \$1.25. and coconut meal \$1.50 per hundred.

9. There is a marked difference in the rate of gains of different individuals in the same lot. Even on the most favorable rations, the rate varies from 60 per cent gain on the original weight to as high

as 160 per cent gain in the same lot. On the average, the self-feeder lots show the most uniformity, simply because the lighter pigs have just as good a chance as the heavier ones. This is not generally true when they are fed in a trough.

10. The cost in feed of each pound of gain increases as the weight increases. A pig should weigh from 200 lbs. to 225 lbs. to command the top market price. Hence it is usually not profitable to market them much lighter than this weight.



## PART II

### DRY-LOT FEEDING

There has been no opportunity to duplicate several of the tests carried on during the winter months. There is so much inquiry, however, concerning the rations that may be efficiently used when pasture is not available, that it seems advisable to give a brief summary of the main dry-lot feeding trials that have been conducted. Some of these not yet repeated will be duplicated as soon as possible. *The results given here are only suggestive and do not warrant drawing general conclusions.*

#### TRIAL I.—THE VALUE OF ALFALFA IN DIFFERENT FORMS FOR PORK PRODUCTION

In this trial four lots of pigs, ten in each lot, all pure-breds, weighing about 78 lbs. each, were used. The first week was preliminary feeding to accustom the pigs to their rations, so that the experiment proper began on January 5 when the pigs weighed about 87 lbs. each.

They were fed as follows:

Lot I. Soaked rolled barley.

Lot II. Soaked rolled barley and whole alfalfa hay in racks.

Lot III. Soaked rolled barley, and cut alfalfa hay soaked with the barley. The amount of hay fed was the same as was put into the rack for Lot II.

Lot IV. Soaked rolled barley and alfalfa meal soaked with the barley. Same amount of meal as Lot II received of whole hay.

The tabulated results are given in Table VI.

Alfalfa meal was the most efficient in this test, and it is interesting to note that only 4.1 lbs. of barley were required for each pound of gain, although the pigs weighed 157 lbs. at the finish.

The long hay (Lot II) was second in efficiency, requiring no more barley than that used with the chopped-hay lot, and 40 per cent less alfalfa. The hay for Lot II is the amount placed in the rack, not the amount actually eaten. The pigs wasted some of it, but the results indicate that it is more economical to let these animals waste some hay than to attempt to force them to eat all of the coarse material, as was done in Lot III.

The "chopped-alfalfa" lot made their gains more economically than did the lot on barley alone, but did not gain so rapidly. The fact that alfalfa hay and alfalfa meal are quite bulky, should not be overlooked when formulating a ration for growing pigs.

TABLE VI

10 PIGS IN EACH LOT. TEST LASTED 70 DAYS

January 5-March 16, 1915

Lot	Feed	Lbs. average initial weight	Lbs. average final weight	Lbs. average total gain per pig	Lbs. average daily gain per pig	Lbs. total feed consumed per pig	Lbs. average daily feed consumed per pig	Lbs. feed consumed per lb. gain
I	Barley	86.3	150.0	63.7	.91	327.3 barley	4.67 barley	5.14 barley
II	Barley	87.5	152.6	65.1	.93	302.7 barley	4.32 barley	4.65 barley
	Alfalfa hay					24.6 alfalfa hay	.35 alfalfa hay	.38 alfalfa hay
III	Barley	86.3	147.9	61.5	.88	285.3 barley	4.08 barley	4.63 barley
	Chopped alfalfa hay					41.5 chopped alfalfa hay	.59 chopped alfalfa hay	.67 chopped alfalfa hay
IV	Barley	87.5	157.1	69.6	.99	285.3 barley	4.08 barley	4.10 barley
	Alfalfa meal					43.2 alfalfa meal	.62 alfalfa meal	.62 alfalfa meal

## TRIAL II.—RELATIVE FEEDING VALUE OF MILO IN VARIOUS FORMS

In this trial, three lots of ten pigs each, all pure-bred, were used. Their average weight was about 88 lbs. at the beginning of the experiment.

They were fed as follows:

Lot I. Whole milo heads and tankage.

Lot II. Threshed milo and tankage.

Lot III. Threshed, ground milo and tankage.

The milo for Lots II and III was fed dry in a trough; for Lot I on a clean concrete floor. The tankage was supplied in self feeders.

The tabulated results are shown in Table VII.

More grain was required for each pound of gain than was expected, but the immaturity of the grain may account for this. Milo might give more satisfactory results if fed in conjunction with alfalfa pasture, for the laxative effect of the latter would probably offset the constipating tendency of the milo.

TRIAL III.—ON THE RELATIVE FEEDING VALUE OF MILO IN DIFFERENT FORMS,  
AND MILO VERSUS BARLEY FOR FATTENING HOGS

This project was planned for the purpose of checking the results obtained in the previous trial on the relative feeding value of milo in various forms, and also to secure data concerning the relative value of milo and barley for fattening hogs.

Five lots of eight pigs each, all pure-breds, were used. Their average weight at the beginning of the experiment was about 95 lbs.

The tankage was self fed, and the grain hand fed as follows:

Lot I. Whole milo heads.

Lot II. Ground milo heads.

Lot III. Soaked milo grain.

Lot IV. Ground milo grain.

Lot V. Ground barley.

The tabulated results are shown in Table VIII.

Milo in various forms proved to be only about 80 per cent as efficient, on the average, as barley in this trial. In the same form, threshed and ground as fed in Lot IV it was slightly more efficient. Two of the lots required about the same amount of tankage to balance the ration as with barley, but Lots I and II, fed milo heads, required twice as much tankage. Grinding the milo instead of soaking it affected a saving of 11 per cent of the milo, indicating that when milo is worth 1c per pound or more, grinding at \$2.00 per ton pays.

Lots I and IV of the trial are comparable with Lots I and II of project 484 (Table VII), the average of which follows:



TABLE VII  
10 PIGS IN EACH LOT. TEST LASTED 137 DAYS  
January 12-May 29, 1917

Lot	Feed	Lbs. average initial weight	Lbs. average final weight	Lbs. average total gain per pig	Lbs. average daily gain per pig	Lbs. total feed consumed per pig	Lbs. average daily feed consumed per pig	Lbs. feed consumed per lb. gain
I	Whole milo heads, tankage	88.2	208.4	120.2	.88	744.7* milo 34.2 tank.	5.44* milo .25 tank.	6.20* milo .28 tank.
II	Threshed milo, tankage	88.05	213.0	110.2**	.81	653.7 milo 30.0 tank.	4.77 milo .22 tank.	5.93 milo .31 tank.
III	Threshed ground milo Tankage	90.7	202.0	108.1***	.79	630.4 milo 30.0 tank	4.60 milo .22 tank	5.83 milo .28 tank

\*16% off for stalks in the heads.  
\*\*Lot II, Yorkshire barrow. Weight 220 lbs. Substituted April 24 for Poland barrow. Weight 75 lbs.  
\*\*\*Poland barrow. Weight 180 lbs. Removed May 10.

TABLE VIII.  
8 PIGS IN EACH LOT. FED FOR 100 DAYS.  
February 5-May 16, 1918.

Lot	Ration	Lbs. initial weight	Lbs. final weight	Lbs. total gain	average daily gain	Lbs. total feed consumed	Lbs. average daily feed consumed per pig	Lbs. average feed consumed per lb. gain
I	Whole milo heads, tankage	764	1391	627	.783	3764.8* grain 304.0 tank.	4.58 grain .38 tank.	5.84 grain .48 tank.
II	Ground milo heads, tankage	765	1489	724	.905	3947.0* grain 391.0 tank.	4.93 grain .49 tank.	5.44 grain .54 tank.
III	Soaked milo grain, tankage	771	1568	797	.996	4695.0 grain 146.5 tank.	5.87 grain .18 tank.	5.88 grain .18 tank.
IV	Ground milo grain, tankage	766	1568	802	1.002	4286.5 grain 205.0 tank.	5.36 grain .25 tank.	5.36 grain .25 tank.
V	Ground barley, tankage	766	1772	1006	1.257	4628.5 grain 251.0 tank.	5.78 grain .31 tank.	4.60 grain .25 tank.

\*10% off for stalks in heads.

TABLE IX

SUMMARY			
Kind of Feed	No. of trials	Lbs. average daily gain	Average feed consumed per lb. gain
Whole milo heads ----- }	2	.83	6.02
Tankage ----- }			.38
Threshed ground milo ----- }	2	.89	4.98
Tankage ----- }			.47
Ground barley ----- }	3	1.34	4.85
Tankage ----- }			.21

TABLE X

6 PIGS IN EACH LOT. TEST LASTED 138 DAYS.  
January 11-May 29, 1917

Lot	Feed	Lbs. average initial weight	Lbs. average final weight	Lbs. ave. total gain per pig	Lbs. ave. daily gain per pig	Lbs. total feed consumed per pig	Lbs. average daily feed consumed per pig	Lbs. feed consumed for 1 lb. gain
IV	Rolled barley Skim milk	62.3	224.7	162.3	1.18	570.9 barley 1742.2 milk	4.14 barley 12.62 milk	3.52 barley 10.73 milk
V	Rolled barley Whey	61.2	221.7	160.5	1.16	591.5 barley 1974.7 whey	4.29 barley 14.31 whey	3.68 barley 12.30 whey



TABLE XI  
8 PIGS IN EACH LOT. FED FOR 80 DAYS  
March 11-May 30, 1918

Lot	Feed	Lbs. average initial weight	Lbs. average final weight	Lbs. ave. total gain per pig	Lbs. ave. daily gain per pig	Lbs. total feed consumed per pig	Lbs. average daily feed consumed per pig	Lbs. feed consumed for 1 lb. gain
I	Ground milo Skim milk	585.0	1575.0	990.0	1.546	2956 milo 8879 milk	4.61 milo 13.87 milk	2.89 milo 8.96 milk
II	Ground milo Whey	583.0	1430.0	847 0	1.323	2956 milo 11402 whey	4.61 milo 17.81 whey	3.49 milo 13.46 whey

TABLE XII			Lbs. average feed consumed for 1 lb. gain	
Kind of Feed	No. of trials	Lbs. average daily gain		
Barley or milo.....	2	1.36	3.20	
Skim milk.....			9.84	
Barley or milo.....	2	1.24	3.58	
Whole milk whey..			12.88	

## TRIAL IV.—THE RELATIVE FATTENING VALUE OF SKIM MILK VERSUS WHEY

From January 11 to May 24, 1917, a period of 138 days, two lots of six pigs each were fed respectively rolled barley one part and skim milk three parts, and rolled barley one part and whole milk whey five parts.

This project was duplicated from March 11 to May 30, 1918—eighty days—with eight pigs in each lot, ground milo being used instead of rolled barley.

The milk and whey were fed in three feeds per day, the barley or milo was placed in self feeders.

The tabulated results of the two trials are given in Tables X and XI, and the combined results in Table XII.

Most authorities agree that 5 to 6 lbs. skim milk equals 1 lb. grain. From this experiment therefore 12.88 lbs. of whey equals approximately 7.94 lbs. of skim milk in producing gains. Sixty-two per cent more whey than skim milk is required to make a pound of gain.

Results less favorable to the whey would be expected with smaller pigs, from the fact that young animals require relatively more protein in their feed than older ones, and skim milk is higher in protein than is whey, which is essentially a carbohydrate feed.

## TRIAL V.—ON THE COMPARATIVE VALUE OF VARIOUS PROTEIN SUPPLEMENTS IN PORK PRODUCTION

Since skim milk and buttermilk are not available on many hog ranches in sufficient amounts to balance the ration correctly, the progressive hog breeder is always on the lookout for commercial substitutes.

This trial was to secure some data on the relative value of digester tankage, fish meal tankage, and milkolene\* compared to skim milk or buttermilk.

Five lots of ten pigs each, all pure-breds, averaging about 122 lbs. each at the beginning of the trial, were fed as follows:

Lot I. Rolled barley, self fed. Skim milk, hand fed.

Lot II. Rolled barley, self fed. Milkolene, hand fed.

Lot III. Rolled barley, self fed. Tankage, self fed.

Lot IV. Rolled barley, self fed. Fish meal, self fed.

Lot V. Rolled barley, self fed.

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\* Milkolene is a patented condensed buttermilk preparation that has lately been placed on the market in this state.

Approximately 3 lbs. of skim milk and of milkolene, the latter diluted according to directions, were fed for each lb. of barley.

The tabulated results appear in Table XIII.

TABLE XIII  
TEN PIGS IN EACH LOT. FED 70 DAYS  
October 10-December 20, 1918

Ration	Lot I Barley Skim milk Lbs.	Lot II Barley Milkolene Lbs.	Lot III Barley Tankage Lbs.	Lot IV Barley Fish meal Lbs.	Lot V Barley Lbs.
Initial weight.....	1236	1231	1234	1226	1228
Final weight.....	2306	2145	2288	2158.5	2182.5
Total gain.....	1070	914	1054	**932.5	*909.5
Average daily gain..	1.53	1.30	1.50	1.33	1.30
Total feed:					
Barley.....	5321	5295	5338½	5160½	5254½
Supplementary	6720	6720	120	164	
feed.....	skim milk	milkolene	tankage	fish meal	
Average daily feed					
Grain.....	7.6	7.56	7.62	7.37	7.50
barley	barley	barley	barley	barley	
Supplementary					
feed.....	9.6	9.60	.17	.23	
skim milk	skim milk	milkolene	tankage	fish meal	
Feed consumed for					
1 lb. of gain.....	4.97	5.79	5.06	5.53	5.78
barley	barley	barley	barley	barley	
6.28	6.28	7.35	.11	.17	
skim milk	skim milk	milkolene	tankage	fish meal	
Cost of 1 lb. gain at					
prices listed below	11.51c	13.41c	10.58c	11.74c	11.56c

\*November 8 one pig died, another 45 lbs. heavier put in, which reduces total gain 45 lbs.

\*\*One pig in this lot gained only 13 lbs., her litter mates gained 100 lbs. or more. Therefore, more satisfactory results are to be expected from fish meal than are shown here.

All lots self fed.

Feeds—Cost:	
Barley.....	\$2.00 per 100 lbs.
Skim milk.....	.25 per 100 lbs.
Milkolene.....	.25 per 100 lbs.
Tankage.....	4.20 per 100 lbs.
Fish meal.....	4.00 per 100 lbs.

It should be noted that the pigs were heavier than average feeders at the beginning of this trial, so that the feed required for each pound of gain appears to be relatively high.

Apparently no gains were secured from the milkolene, the amount of barley required for a pound of gain being almost identically the same in Lots II and V. Little was learned on the comparative value of fish meal and tankage because of the unthriftiness of one pig in Lot IV, which was not evident at the time the trial was begun.

This project was duplicated two months later with pigs averaging about 112 lbs., and the summary follows in Table XIV.



In this trial, fish meal gave about the same results as tankage. Because of a scarcity of pigs, no lot was fed barley alone, but it is interesting to note that the amount of barley required for a pound of gain in Lot II was very similar to that required in Lots II and V of the previous trial where no gains could apparently be credited to the milkoline.

In this trial skim milk was somewhat more economical than was tankage in the first trial.

The average of the two trials is as follows:

TABLE XIV

TEN PIGS IN EACH LOT. FED 58 DAYS

February 25-April 24, 1919

Ration	Lot I Ground barley Skim milk lbs.	Lot II Ground barley Milkolene lbs.	Lot III Ground barley Tankage lbs.	Lot IV Ground barley Fish meal lbs.
Initial weight.....	1118	1128	1129	1122
Final weight.....	2045	1864	1922	1904
Total gain.....	927	*676	793	782
Average daily gain per pig.....	1.60	1.17	1.37	1.35
Total feed.....	3833 barley 6534 milk	3890 barley 6534 milkolene	3887 barley 229 tankage	3831 barley 226 fish meal
Av. daily feed.....	6.6 barley 11.3 sk. milk	6.7 barley 11.3 milkolene	6.7 barley .39 tankage	6.6 barley .39 fish m.
Feed consumed for 1 lb. of gain.....	4.13 barley 7.05 sk. milk	5.75 barley 7.05 milkolene	4.90 barley .28 tank.	4.89 barley .29 fish m.
Cost of 1 lb. gain at prices listed below	10.2	13.26	10.98	10.84

\*March 4 one Berkshire gilt, weight 115 lbs., taken out, Duroc barrow, weight 175 lbs., put in, which reduces total gain 60 lbs.

All lots self fed—each fed in separate feeders, except skim milk and milkolene—they were hand fed.

## Feeds—Cost:

Barley.....	\$2.00 per 100 lbs.
Skim milk.....	.25 per 100 lbs.
Milkolene.....	.25 per 100 lbs.
Tankage.....	4.20 per 100 lbs.
Fish meal.....	4.00 per 100 lbs.

TABLE XV

SUMMARY—PROTEIN SUPPLEMENTS

Kind of Feed	No. of trials	Lbs. average daily gain	Feed required for 1 lb. gain
Barley.....	2	1.56	4.55 barley
Skim milk.....			6.66 skim milk
Barley.....	2	1.23	5.77 barley
Milkolene.....			8.47 milkolene
Barley.....	2	1.43	4.98 barley
Tankage.....			.19 tankage
Barley.....	2	1.34	5.21 barley
Fish meal.....			.23 fish meal

The averages shown in Table XV would indicate that the prices paid for skim milk and tankage, namely \$0.25 and \$4.20 per hundred are the correct relative prices of these two feeds according to the averages of those two experiments.

TRIAL VI.—THE VALUE OF RAISINS AS A FEED FOR SWINE\*

The market price of raisins has sometimes been very low and there has often been an available supply of second-grade or cull raisins that may be fed to hogs. This trial was conducted for the purpose of determining the value of this material for feeding hogs.

The different lots included in the trial were fed as follows:

Lot I. Ground or rolled barley and alfalfa meal in the proportion of 5:1, by weight.

Lot II. Barley, ground or rolled, and raisins, equal parts, with the same amount of alfalfa meal as Lot I.

Lot III. Raisins and alfalfa meal, the same amount of alfalfa meal as fed to Lot I.

The experiment proper began February 25, 1916, when the pigs averaged about 110 lbs. each.

The results of this experiment are shown in Table XVI.

Fourteen different varieties of dried grapes were used in this trial. While no attempt was made to determine the difference in feeding value of the different varieties, it was noticeable that the pigs relished some much more than others, and thrived accordingly.

The pigs seemed to relish the raisins at first, but tired of them toward the close, especially Lot III. It was hard to keep this lot on feed. Occasionally they scoured severely. Lot II gave none of these troubles.

The sugar in the raisins, according to the chemical analysis, ran as high as 73.9 per cent and as low as 52.9 per cent; the crude fiber varied from 10.40 per cent to 1.35 per cent, and the acid (calculated as tartaric acid) from 3.0 per cent to 1.20 per cent.

It will be noted from Table XVI that the raisins were much more effective when constituting only one-half of the ration than when fed alone. When fed half and half, 2.97 lbs. of raisins equalled 2.66 lbs. of barley. They were, therefore, 89 per cent as efficient, but when fed alone it required 11.13 lbs. of raisins to equal 5.63 lbs. of barley, an efficiency of 50 per cent. They had, in reality, even a still lower efficiency when fed alone, for the pigs on raisins only reached a weight of 149.5 lbs. on the average, while those on barley reached an average weight of 213.7 lbs.

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\* This trial was conducted in coöperation with the Division of Viticulture, at the suggestion of Professor F. T. Bioletti.

TABLE XVI

8 PIGS IN EACH LOT. TEST LASTED 105 DAYS

February 25-June 9, 1916

Lot	Feed	Lbs. average initial weight	Lbs. average final weight	Lbs. average total gain per pig	Lbs. average daily gain per pig	Lbs. total feed consumed per pig	Lbs. average daily feed consumed per pig	Lbs. feed consumed per lb. gain
I	Barley 5 Alfalfa meal 1	115.2	213.7	98.5	.94	554.7 barley	5.28 barley	5.63 barley
						60.1 alfalfa meal	.57 alfalfa meal	.61 alfalfa meal
						14.2 chopped alfalfa hay	.13 chopped alfalfa hay	.15 chopped alfalfa hay
II	Barley 2½ Raisins 2½ Alfalfa meal 1	108.1	201.7	93.6	.89	278.7 barley	2.65 barley	2.97 barley
						278.7 raisins	2.65 raisins	2.97 raisins
						60.4 alfalfa meal	.57 alfalfa meal	.64 alfalfa meal
III	Raisins 5 Alfalfa meal 1	108.1	149.5	41.4	.39	14.2 chopped alfalfa hay	.13 chopped alfalfa hay	.15 chopped alfalfa hay
						460.6 raisins	4.39 raisins	11.13 raisins
						52.6 alfalfa meal	.50 alfalfa meal	1.27 alfalfa meal
						8.0 chopped alfalfa hay	.07 chopped alfalfa hay	.19 chopped alfalfa hay

NOTE.—On March 3, pig No. 213, Lot I. died of pneumonia. Weight 85 lbs. The substitute weighed 88 lbs. On March 4, pig No. 211, Lot III, died of pneumonia. Weight 126 lbs. The substitute weighed 110 lbs.



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